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FARM & HOME SCIENCE

PUBLISHED QUARTERLY BY THE UTAH AGRICULTURAL EXPERIMENT STATION

Vol. 2

Logan, Utah, June 1941

No. 2

Utah Youth Study Initiated

Education, Employment and Migration of Youth in Utah
Being Surveyed

By JOSEPH A. GEDDES

UTAH's human stock, like that of most of the western states is on the whole an expanding one. From natural increase the ratio between numbers and resources is at least maintained and there is even a surplus which moves out into nearby states and beyond.

A comparatively young expanding people who are concerned with their future, such as those living in Utah, should know just who are migrating and who are remaining to build up the state. Their leaders need to know the existing standards of living and the numbers that are in different income classifications. If conditions are healthy the standards should constantly rise.

More satisfactory information is available concerning population increases than is known of ratios between numbers and resources or of trends in standards of living. Utah has grown more slowly in population than most of the neighboring states. During the 50 years between 1890 and 1940 the population of Utah has increased 260.2 percent whereas the percentage increase for other western states are: Idaho 591.1, Oregon 342.4, Montana 387.7, Colorado 270.7, California 566.5, New Mexico 329.8, Arizona 564.1, Wyoming 394.5 and Washington 481.9.

Is this slow growth in Utah purely a reflection of limited irrigation water and farm land resources? Supporting this deduction, although not proving it, is a considerable overflow of Utah people into other states. In 1930 native-born former residents of Utah living in other states numbered 142,582 which is equivalent to 27.3 percent of the state's population in that year. The percentage of native born in California who now live in other states is much lower than this, being only 8.3 percent.

Most of the other western states approximate Utah in this matter, however, Oregon having 28.4 percent, Washington 23.7 percent, New Mexico 29.5 percent and Wyoming 44.2 percent.

It is a usual assumption that Utah families are large. Yet, it is true that Utah's population is not growing as rapidly as many neighboring states. Urban population is larger proportionately in Utah than in most of the mountain states. Birth rates are usually low in cities. Has Utah's limited resources already influenced the birth rate more than is currently known? Have the limiting factors of tillable land and irrigation water set off against increasing population brought more or less permanent states of unemployment, underemployment or unprofitable employment, or has the rate of migration kept pace with existing pressures so that the slowly expanding population has found slowly expanding resources in irrigable land and in the processing industries a match or more than a match for the increase in numbers?

Many graduates of Utah colleges are known to live outside of Utah, particularly in Pacific Coast states. Dawson Simpson found that 1,647 graduates of the Utah State Agricultural College lived outside the state in 1939. The movement outside of the state is paralleled by the movement from the farm to the city. If Utah cities do not grow fast enough to take care of the stream of surplus population from the farms, many must go on to the cities of other states where they find more favorable positions than they are able to obtain at home.

Evidences are numerous that the oncoming generation's problem of getting
(Continued on page 11)

LAND-USE PLANNING TRIES TO COORDINATE STATE AGRICULTURAL PROGRAM

Committees Study Land and
Water Development, Livestock
Improvement, Weed Control and
Related Farm Problems

THE land-use planning movement which has spread during the past three years to more than 1500 counties in 46 states is well under way in Utah. The movement is really a cooperative effort on the part of representative farmers, various agencies of the United States Department of Agriculture, the Land-Grant Colleges, and other state and local agencies to work out agricultural plans, policies and programs for their state, county and community. It is merely an extension of the so-called democratic process through the joint participation of farmers, technicians and administrators in an attempt to better solve the farm problem.

County Planning Boards

County planning boards were organized in Utah by the Agricultural Extension Service prior to the land-use planning movement on a nation-wide scale. The Extension Service encouraged farmers and farm women to organize planning committees and assisted them (1) to inventory their resources, (2) to list their farm practices, (3) to study their home and health problems, and (4) to plan ways and means to improve their situation. As a result of this effort every county in the state has some form of planning organization and most of the larger counties have a well integrated list of committees working on such problems as land and water development, livestock improvement, weeds and seeds, health, credit and finance, new crops and new industries, taxation, and rural youth problems.

Mount Weather Agreement

Having similar objectives in mind,
(Continued on page 10)

TWO NEW LABORATORIES DEVELOPED BY THE ANIMAL HUSBANDRY DEPARTMENT

By RALPH W. PHILLIPS

DURING the past year, two laboratories, one for animal breeding and nutrition, and one for wool research, have been developed. The facilities thus provided fill one of the serious gaps in the equipment needed so that the Experiment Station may serve adequately the livestock industry.

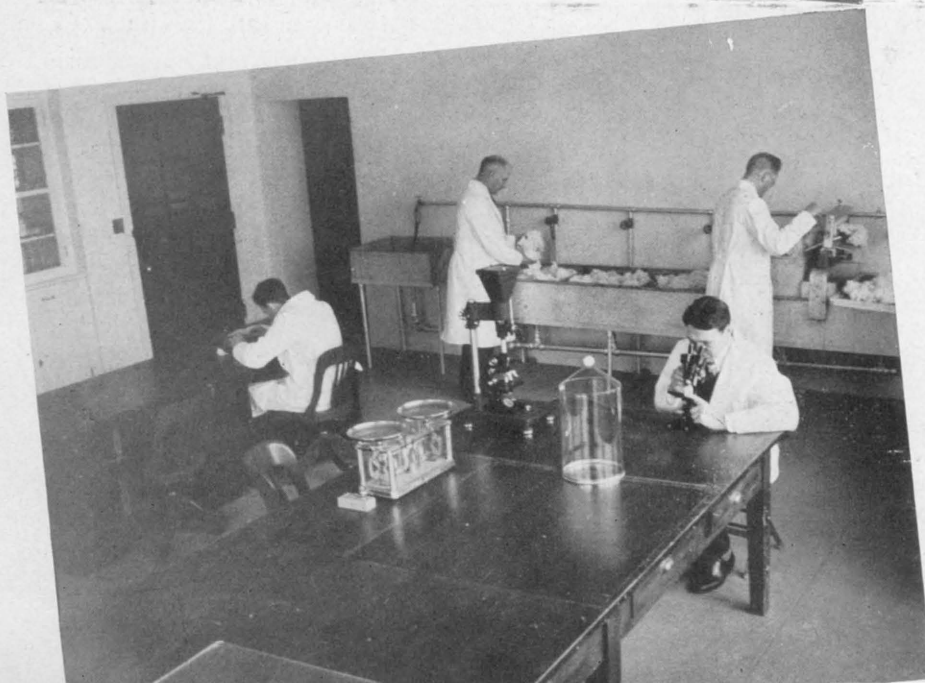
Experiment Station projects now being conducted in the field of Animal Husbandry include the following:

- (1) A study of the factors affecting size of lamb crop in range sheep.
- (2) A study of the nutritive value of range forages.
- (3) The value of beet molasses in rations of growing and fattening hogs.
- (4) Studies of methods of sampling and scouring fleeces to determine shrinkage.
- (5) Development of inbred lines in sheep, and studies of methods of measuring performance.

The laboratory phases of these various Experiment Station projects are carried out in the new laboratories. For example, the study which is designed to determine methods of increasing the size of lamb crop is being carried out primarily at the Desert Range Experiment Station in Millard County in cooperation with the Forest Service. In order to get at the basic reasons for low lamb crops, blood samples from the experimental sheep are brought to the laboratory for testing. Sections of tissue from reproductive tracts of some of the experimental animals are also used for detailed histological studies.

The same type of correlation between field and laboratory work is found in the other projects.

The Animal Breeding and Nutrition Laboratory is reasonably well equipped for histological and physiological work, and for some phases of chemical analyses of feedstuffs. The Wool Laboratory is equipped for scouring fleeces, and cross-sectioning of wool fibers. It also has projection and photomicrographic equipment for detailed studies of animal fibers. It is only by the use of very careful laboratory techniques such as those mentioned above that it is possible to get at the basic answers to many of our practical field problems. Hence, these laboratories will serve in a very real manner in helping to answer some of the problems faced by the livestock industry in Utah.



CONTROL MEASURES PLANNED TO PREVENT LOSSES FROM PEA WEEVIL

Use of Weevil-Free Seed and Dusting will Prevent Repetition of Last Year's Losses

By GEORGE F. KNOWLTON

THE growing of peas on approximately 13,000 acres of irrigated land is an important cash crop to nearly 5,000 Utah farmers. In addition this creates a canning industry which provides seasonal employment for a large number of local men and women. This is a crop and an industry worth much to the state and its people.

During recent years many pea-growing areas in the west have been menaced by the pea weevil. After slowly increasing in numbers for several seasons this pest suddenly appeared in damaging abundance in many northern Utah pea-growing communities during 1940. The United States Pure Food and Drug Administration will not permit interstate shipment of peas containing insects, and canners will not process an infested product. As a result many thousands of dollars worth of peas were not harvested, or were dumped out or fed to hogs during 1940.

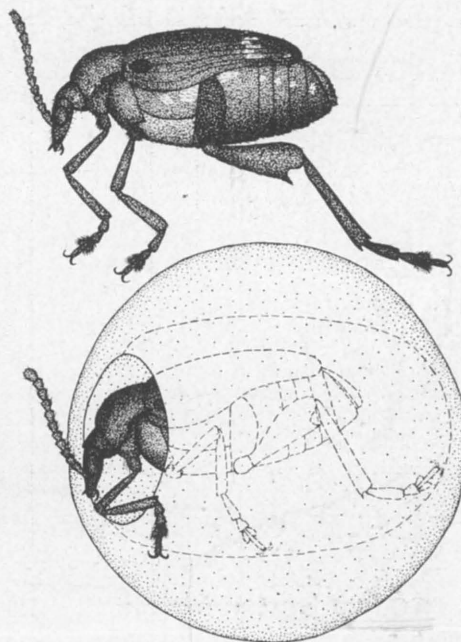
To meet this situation in 1941, Utah canners are buying the finest type of

dusting machines, and will have adequate supplies of rotenone bearing derris and cube dusts on hand to cope effectively with this pest. In addition they will hire trained men to inspect all pea fields for weevil.

Effective cooperation of farmers with the canners will be essential for protection of the canning-pea crop this year. Failure to locate and to treat promptly infested fields may result in loss of the entire crop.

The control program is briefly as follows:

1. The planting of only high grade, weevil-free seed.
2. Careful examination by trained survey men of all pea fields as they come into bloom and every few days thereafter until nearly time for harvest.
3. The dusting of all infested fields just before the first pods set. This treatment must be repeated whenever re-infestation occurs. Twenty pounds of a one percent rotenone bearing derris or cube dust must be applied to each



Upper: Side view of pea weevil; lower: weevil emerging from infested pea

acre per application, to obtain effective control. Proper timing of applications is essential.

4. Plowing of fields to a depth of 6 to 8 inches as soon as possible after the pea crop is harvested. Vines in home gardens and commercial pod-pea fields should be pulled and destroyed as soon as the peas have passed the edible stage.

ASPARAGUS BEETLE THREATENS CROP

By GEORGE F. KNOWLTON

RECENTLY introduced pest, the asparagus beetle, now threatens the commercial and home garden asparagus patches of Northern Utah. Failure to adequately control this pest during the past three seasons has resulted in increased spread and serious financial loss to many commercial growers at a time when asparagus was bringing a good price on the early market. The asparagus beetle now occurs from the north border of Weber County south to North Farmington in Davis County. During 1940 infestation also was found at Logan.

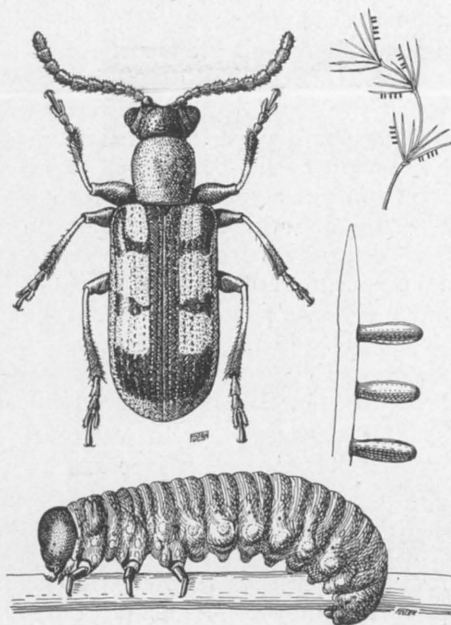
The slender, active, brightly colored adult beetle survives the winter in sheltered places, emerging in the spring to feed and lay eggs upon the tender new growth of asparagus. No other plant is attacked by this pest. The feeding scars make the plant unsightly and often cause a twisted growth on the tips. Eggs laid upon the plants also are objectionable. Larvae (called "slugs") hatching from the eggs, feed upon and injure the plant in the same manner as the adult weevils.

Control is best effected by means of arsenical sprays applied to the older plants once or twice during late summer after blossoming has been com-

pleted. Control in early spring during harvest operations is more difficult, but may be accomplished by repeated dusting or spraying of the plants with one percent rotenone bearing derris or cube, and by cutting all stocks promptly every three to five days. Arsenical materials are not recommended for use in early season on plants to be cut, as these insecticides would leave an objectionable residue on shoots intended for human consumption.

A few plants left to grow large, around the field margin and in one or two rows in the field, will serve to attract many beetles. Such adult beetles and any larvae hatching will be killed by spraying or dusting such plants each five to seven days; this helps to lessen the attack upon the young, commercial crop.

Howard E. Dorst, of the Bureau of Entomology and Plant Quarantine, formerly stationed on the campus, has been called into army service. Walter E. Peay has been transferred from Boise, Idaho, to take charge of the tomato insect work. Mr. Peay is a graduate of Utah State.



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Address correspondence regarding material appearing in these columns either to the editor or to the author.

More detailed information on the subjects discussed here can often be found in Station bulletins and circulars or may be had through correspondence.

FEDERAL COOPERATION

THE extent to which the Federal Government is cooperating with the Station in the prosecution of the agricultural research program is not generally known nor understood by the farm people. A perusal of the articles in this issue of Farm and Home Science will give some idea of the scope of this assistance. The Station is cooperating with the Bureau of Agricultural Economics in the rural youth and the land use planning studies. The grass breeding program, the alfalfa improvement work, and work on saline soils is done in cooperation with the Bureau of Plant Industry. The dairy production work is carried on jointly with the Bureau of Dairy Industry.

Aside from the federal workers stationed on the campus at Logan, the U. S. Department of Agriculture, through cooperative agreements, supplies financial and other aid to the Experiment Station. Much of the work now underway would be impossible were it not for support other than that made by regular state and federal grants.

All of the cooperative research between the Station and the bureaus of the U. S. Department of Agriculture is coordinated through the office of director of research of the Office of Experiment Stations in the Department of Agriculture.

Measurements of water losses in canals in Millard County showed losses of from 2 to 10 percent in the distance of a mile. As a result of these studies, Millard County, the Experiment Station and the W.P.A. are cooperating in a project using local clay deposits for lining the canals.

Melbourne D. Wallace, research assistant in vegetable crops, resigned to accept the position of fieldman with the Pleasant Grove Canning Company.

GOOD BUTTERFAT PRODUCTION OBTAINED THROUGH FEEDING OF ROUGHAGES

Grain Necessary for High Production

By GEORGE B. CAINE

ALFALFA hay has always been one of the most common and cheap forms of roughage in the intermountain region. It has been fed extensively to dairy cattle, in many cases exclusively. Dairy Herd Improvement records for many years have shown that economical production was obtained from the feeding of roughages and pasture in season. Alfalfa and corn silage are two crops that will yield more nutrients per acre than any other farm feeds grown in this region. The price of grain is usually proportionately higher in Utah than roughages, which has always made grain feeding more expensive than roughage alone.

In order to establish more definitely the value of the different rations in dairy cattle feeding an experiment was planned by the Station in cooperation with the U. S. Bureau of Dairy Industry. This experiment had for its object the obtaining of data on the quantity of milk and butterfat produced by dairy cows when kept under average herd conditions, milked twice daily and fed throughout the lactation period on a ration containing home-grown roughages and either a moderate or limited amount of grain, or on a ration of home-grown roughages only, with or without corn silage.

Twelve Holstein cows were selected from the experimental herd for this test and fed for a complete lactation period of 331.4 days on each ration. Preceding this experiment all the cows had had one lactation on what is termed a standard or full grain ration which consisted of all the alfalfa hay they would eat, corn silage fed at rate of 3 pounds per day per hundred pounds live weight of the cows, good pasture in season, and a grain mixture made up of barley 2 parts, oats 1 part and wheat bran 1 part. The cows were fed the grain mixture at the rate of one pound a day for each pound of butterfat produced in 7 days. Grain feeding was discontinued when butterfat production dropped below 20 pounds per month.

The experimental rations were made up as follows: *Ration 1* consisted of alfalfa hay alone or pasture alone as long as it was good. Some hay was substituted when pastures became short. *Ration 2* consisted of alfalfa hay and pasture with the addition of ground

barley. The barley was fed at the rate of one pound a day for each 6 pounds of milk produced a day. *Ration 3* consisted of alfalfa hay and pasture, with the addition of corn silage. Silage was fed at the rate of 3 pounds a day to each hundred pounds live weight of the cow. The cows in all groups were fed all the alfalfa they would eat each day. On the standard or full grain ration fed during the lactation period before this experiment was begun the cows produced 433 pounds of butterfat. *Ration 1* produced 285 pounds of butterfat, *ration 2* produced 348 pounds, and *ration 3*, 303 pounds.

Assuming the production of butterfat on the standard ration was 100 percent, the cows produced 65.77 percent on *ration 1*, 80.24 percent on *ration 2*, and 69.93 percent on *ration 3*.

These data show that the addition of corn silage to an alfalfa ration produced an increase of 18 pounds of butterfat which is economical production. The addition of barley to the straight alfalfa ration added 63 pounds of butterfat per cow.

The experiment shows the value of grain feeding for high production, but it also shows that good production can be obtained through roughage feeding. In many cases, depending on the price of feed and butterfat, roughage feeding may be more economical than grain feeding.

This work is discussed in greater detail in the U. S. Dept. of Agr. Tech. Bul. 724, Milk and butterfat production by dairy cows on four different planes of feeding, by R. R. Graves and George Q. Bateman. Copies of this publication are available at the Station office.

COCCIDIOSIS IN YOUNG CHICKENS

Coccidiosis is prevalent in young birds between four to twelve weeks of age, during the spring and summer months. Birds so affected show blood-stained droppings, unkept appearance, depression, and high mortality. Birds which have died of this disease show marked paleness of comb, lining of mouth, and eyes. Adherence to strict sanitary measures is the only means of prevention. The house must be kept clean, dry and well ventilated, and overcrowding must be prevented. The watering equipment should be so arranged that the birds cannot get into it with their feet, or so the water does not run over the edges of the pan keeping the surrounding area damp.

Regional Salinity Laboratory Cooperates with Experiment Stations in Solving Alkali Problems

Most Serious Problems Facing Irrigated Agriculture to be Attacked Jointly
by U. S. Department of Agriculture and the Experiment Stations of the West

By R. H. WALKER



General view inside greenhouse showing tank cultures and peach trees

THE excessive accumulation of soluble salts or "alkali" in the soil is one of the most serious problems of irrigation agriculture in the Western United States. On lands so affected the productivity is materially reduced and in severe cases impaired to the point where crop production is no longer practicable. It has been estimated that approximately half the 18 million acres of irrigated land in the West is now affected in some degree by soluble salts.

Ways and means of successfully and economically ridding the soil of alkali salts or of preventing their accumulation through rising water tables following irrigation have not yet been developed. Many experiments have been conducted which have contributed much to our knowledge of how best to manage alkali soils but the information thus obtained is incomplete and points toward the need for additional experimental studies of land drainage, irrigation methods, and a study of the chemical and physical action of the salts on the soil and of their effects upon growing crop plants. We need to know more about the reactions occurring between the soil and the salts and their resulting effect upon water movement through the soil before we can develop effective and efficient methods of alkali control. Obviously this information is basic to the development of an effective drainage program, and it is generally agreed that

good drainage is essential to alkali control for it is through the percolation of water down through the soil and out in the drainage system that the salts are carried away in solution and removed from the land.

Individual farmers have neither the funds nor the facilities to conduct the kinds of investigations needed to solve the alkali problem. Already too many of them have lost a large portion of their life's earnings and even their farms in an effort to make their alkali lands produce. Conducting an investigational program of this type is a huge task and an expensive one that can be financed only by public agencies. Even the state agricultural experiment stations of the West, although they have made substantial contributions to our information on alkali, have not been able to tackle the problem on a sufficiently large scale to complete the work in a reasonable period of time. Furthermore it has been found that working individually they have not been able to accomplish as much as they could if

working cooperatively through a central agency and on a well coordinated program.

In order to meet these difficulties the experiment station directors in the eleven western states, in cooperation with the United States Department of Agriculture, proposed that a laboratory be developed with federal funds for the support of the type of research program needed. As a result of this proposal the U. S. Regional Salinity Laboratory was established in 1937.

This laboratory is located at Riverside, California. The director of the laboratory and the research staff are employed by the Bureau of Plant Industry. The eleven western state experiment stations are each represented by one of their own staff members who has been selected to serve as a collaborator in the research of the laboratory. Together with the director of the laboratory the collaborators assist in developing plans for the research work and also in the coordination of all the research related to the salinity problem in the several states and at the Regional Salinity Laboratory. Dr. O. W. Israel-

(Continued on page 10)

Regional Salinity Laboratory building and grounds





Planting nurse-crop plots with a 3-foot drill and garden tractor

NURSE CROPS NOT ADVISABLE IN RANGE RESEEDING

In Arid Regions These Crops Use Moisture Needed by Grasses

By L. A. STODDART

THE use of so-called nurse crops in agriculture is an old practice and is still common in many areas for many crops. It consists of planting a rapid-growing, temporary plant, along with the permanent crop, the purpose being to provide a protection to the young plants. Many plants seem to grow better when shaded and protected from winds by larger or more rapid-growing species.

This practice, often successful on moist farm lands, has been carried over to dry range lands in Utah where a nurse crop, usually a small grain, occasionally is planted with cultivated grasses for the purpose of protecting the young grasses, increasing the forage, and providing quick cover for soil protection.

Since 1938 the Range Management

Department of the Utah Station has been carrying on detailed experiments upon the desirability of seeding a small grain nurse crop along with grass on range lands. Experiments are now under way at three stations, namely, benchlands near Logan, representative of intermediate rainfall zones; desert lands near Vernon, representative of more arid zones; and high mountains on the Bear River range, representative of high rainfall zones. The data herein reported are all from the intermediate zone though preliminary figures from the other two stations indicate that comparable conditions exist in other rainfall zones.

In the fall of 1938 an area was seeded to a mixture of equal parts of crested wheatgrass, western wheatgrass, smooth brome grass, and tall oat-

grass at a rate of 12 pounds of seed per acre. This seeding was then overlaid by small scattered plots some of which were seeded to a nurse crop of winter rye at a rate of 3 pounds, 10 pounds, and 25 pounds per acre and some of which were not planted to rye.

Excellent growth was made in the fall by both the grass and the grain. The following spring no apparent difference existed between the grass under the nurse crop and that without a nurse crop, both of which formed excellent stands. During the hot summer of 1939, however, the grass seeded under grain, even the lightest seeding of grain, made a very significantly lesser height growth but produced somewhat more plants per unit area. Early in the summer, however, the plants under the grain showed signs of drying whereas many of the plants without a nurse crop remained green throughout the summer. This tendency toward a more severe drought condition under the nurse crop, caused, doubtless, by the drain on soil moisture made by the grain, was strikingly evident throughout the middle and late summer period.

After growth was completed in the fall of 1939 and again in the fall of 1940 sample plots were clipped. The grass yield was separated and weighed by species. The yields are shown in the table.

Rye is, itself, a good forage plant and it produced a yield in 1939 far in excess of the grass yield so that the total yield (both grass and rye) from the rye plots exceeded that from the plots without rye. Since rye volunteers very effectively, there was also a heavy rye yield in 1940 but the grass yield from plots without a nurse crop was so heavy that, in most instances, it was greater than the yield of both grass and grain on plots having a nurse crop. While data are not yet available, it is believed that after the second year the seedings without a nurse crop regularly will outyield those with a rye nurse crop, including the rye yield.

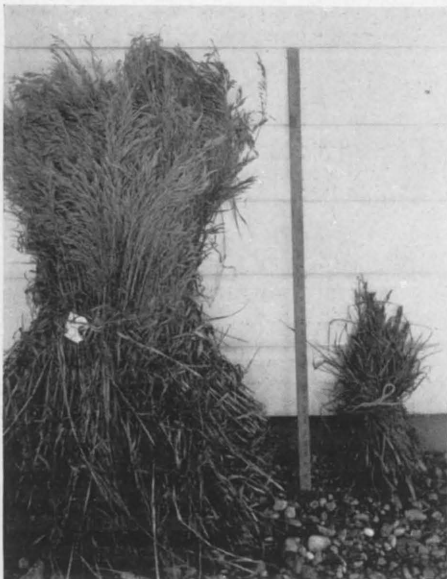
Rye grows rapidly and, hence will furnish a dense cover for soil protection early in the first year. However, it seems to be so detrimental to the yield of the perennial grasses which it is supposed to nurse that its use is rarely justifiable on arid western lands.

Since range grasses should be totally protected from grazing during their

(Continued on page 11)

Average grass yields in grams per square meter from 6 plots taken in each of 3 intensities of nurse crop compared to yield without a nurse crop

Species	1939				1940			
	No nurse crop	3 pounds rye per acre	10 pounds rye per acre	25 pounds rye per acre	No nurse crop	3 pounds rye per acre	10 pounds rye per acre	25 pounds rye per acre
	grams	grams	grams	grams	grams	grams	grams	grams
Crested wheatgrass.....	123.3	30.0	28.0	4.6	314.1	85.5	57.0	9.1
Smooth brome grass	42.5	00.8	00.0	0.0	29.1	24.0	00.3	0.0
Western wheatgrass	9.8	00.0	00.0	0.0	2.6	00.0	00.0	0.0
Tall oatgrass	6.3	00.8	00.0	0.0	000.3	00.3	00.5	0.0
Total grass yield	182.9	31.6	28.0	4.6	346.1	109.8	57.8	9.1



Differences in yield as great as these are encountered in smooth brome grass when a large number of plants are examined

GRASS is one of the great natural resources with which this country was originally richly endowed. It played a leading role in the history of the west during settlement and is as important today as at any time in the past.

A grass improvement program to serve the Intermountain Area was begun in 1936 by the U. S. Department of Agriculture, Division of Forage Crops & Diseases, in cooperation with the Utah Agricultural Experiment Station and the Intermountain Forest and Range Experiment Station. The objective of this program is the discovery or development of superior strains of grasses for use in the maintenance and strengthening of the various systems of permanent agriculture. That use may be in irrigated pastures on highly productive land, on marginal farm land, on abandoned dry-farm land or the widely varying conditions of the foothill and mountain ranges. Perhaps the most urgent need relates to the restoration of grass on range and abandoned dry-farm lands, areas where acute feed shortages are encountered, and where, without the protective influence of grass, the lands are most susceptible to ruin by erosion.

The abandoned dry-farm lands and adjacent spring-fall ranges are subject to low rainfall and periods of prolonged summer drought. This zone is dominated by the wheatgrasses (*Agropyrons*), and it is here that crested wheatgrass (*A. cristatum*) is of greatest value. At higher elevations, where moisture is more plentiful and droughts are of shorter duration, the brome

RANGE IMPROVEMENT THROUGH BETTER VARIETIES OF GRASS IS AIM OF BREEDING PROGRAM

Grass Important in Restoring Abandoned Dry Farm Lands

By WESLEY KELLER
U. S. Bureau of Plant Industry

grasses (*Bromus*) are of great importance. There is of course some overlapping, for example, smooth brome grass (*B. inermis*) makes a good showing on the more favorable parts of the wheatgrass zone, while slender wheatgrass (*A. pauciflorum*), less drought resistant than smooth brome, is perhaps more important at high than at low elevations. Numerous other species of grasses are of more or less importance in restricted areas.

During the first two years that the grass improvement program was in operation (1936-37) a large number of species of grasses were grown and their characteristics and breeding behavior noted, but by 1938, active attention had been restricted chiefly to four species, crested, slender and bluestem wheatgrass and smooth brome grass. Each of these species differs from the others in one or more important characteristics which influences the manner in which its improvement is attempted. For example, crested and slender wheat are bunchgrasses, but the latter is predominantly self fertilized. Bluestem and smooth brome are cross fertilized, but these species are "spreaders." This greatly complicates the evaluation of single plants. Smooth brome spreads relatively slowly and individual plants vary greatly in tendency to spread. Spreading plants soon become sod-bound and are never as productive, per

unit of area covered, as are non-spreaders. Bluestem is a rapid spreader, but here again individual plants vary greatly. This species does not appear to become sod-bound as quickly, or to as great an extent, as does smooth brome.

Among the cross fertilized grasses, once the desired plants are identified, the simplest method of improvement consists in restricting the fertilization of the selected plants to pollen from within the group. The progeny of this selected group will not all resemble the parent plants, but the parental type should be more abundant than in the original population. Further concentration of the desired characteristics will result from repeated selections in subsequent generations. This method, known as "mass selection," has been an important means of improving many species of cultivated plants. It is playing an important part in grass improvement today, and is expected to contribute many valuable strains. Several other methods, somewhat more complicated than mass selection, are also being employed.

In general, grass breeding is complicated by the necessity of including animals in the evaluation of selections. There is no satisfactory substitute for grazing. Another complicating factor is that, owing to seasonal influences, no single season is likely to provide an accurate estimate of a plant's yielding

(Continued on page 11)

100 selections of slender wheatgrass are being tested in the field shown below



Relation of Lygus Bug Damage to Alfalfa Seed Crop Failures Investigated

Causes of Seed-Crop Failures Numerous, Lygus Bug Damage Contributing Factor of Great Importance

By JOHN W. CARLSON
U. S. Bureau of Plant Industry

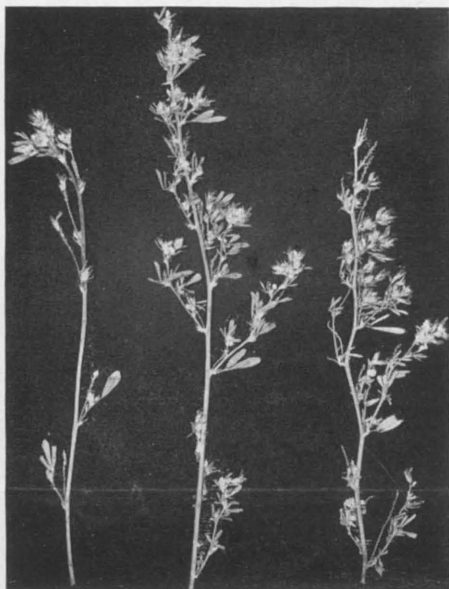


Figure 1. Terminal portions of three alfalfa stems showing "Lygus" damage. The racemes of buds are small, unusually numerous, crowded and generally discolored. A tendency to excessive branching and the development of short internodes near the stem terminals is shown. Specimens from an alfalfa field heavily infested with "Lygus" bugs

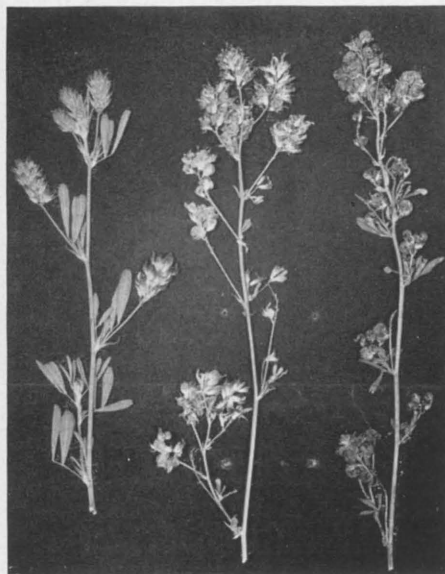


Figure 2. Terminal portions of three alfalfa stems showing an approximately normal development of buds, flowers and seed pods. A normal elongation of the internodes and the occurrence of the racemes of buds and flowers on long peduncles is shown. Crowding of the inflorescences is not apparent and most of the racemes have a large number of buds and flowers, a large proportion of which develop into seed pods. Specimens from an isolated plant far from cultivated fields of alfalfa

Low yields of alfalfa seed in Utah are apparently, at least partly, attributable to a bud damage and flower fall that results from injury caused by *Lygus* bugs, (*Lygus hesperus* Knight and *L. elisus* Van Duzee.) While long continued investigations have shown that many factors affect seed setting, no complete and fully satisfactory explanation has been made of the major declines in yields of alfalfa seed and of the seed-crop failures that have occurred in Utah. The investigation reviewed here was made cooperatively with the division of Forage Crops and Diseases, U. S. Department of Agriculture and the Wisconsin and Utah Agricultural Experiment Stations, and is an attempt to determine the nature of the damage caused by *Lygus* bugs to alfalfa and to obtain evidence of the importance of these insects in relation to the rapid decline in yields of alfalfa seed in several formerly highly productive regions of Utah. Special attention has been given to various types of bud and flower damage from which result low yields and generally unsatisfactory alfalfa seed crops. Some of the bud damage has been shown by controlled infestation to result directly from punctures made by *Lygus* bugs while feeding, al-

though pathological effects develop also from the initial direct damage and seem to impair greatly the ability of the alfalfa plants to produce normal buds and flowers that are capable of forming seed pods.

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Characteristics of Lygus Damage

Bud damage and flower fall in alfalfa that are attributable to *Lygus* infestation are shown in seed fields by whitish-yellow areas or strips that are conspicuous in contrast with the normal deep green of undamaged and healthy plants. The discoloration results from the presence on the plants of dead, dried and bleached buds and disintegrating remains of flower clusters. Detailed symptoms and evidence of *Lygus* damage in alfalfa vary with the age of the growth and of the plants, as well as with the intensity of the infestation. New and young growth is often noticeably retarded, while infestation of older growth results in a characteristic "stringiness" or excessive branching

by the plants. Under *Lygus* infestation stems of new growth are sometimes unusually short and thick and may be terminated by a cluster or rosette of many small and distorted groups of buds. Alfalfa in fields that have been recently irrigated, or where the growth is for some reason exceptionally rank and succulent, appears to be particularly susceptible to bud damage. Typical *Lygus* damage to alfalfa is illustrated in figure 1. For comparison, figure 2 shows stems with clusters of healthy buds, flowers and seed pods that are borne on long stalks. Discoloration and disintegration of damaged buds begin at punctures made by the bugs. The disintegration apparently results from a toxic or irritant substance that is emitted with the saliva of the insects at the time of feeding. The punctures can be seen only in buds that are sectioned on the microscope, stained and examined under the microscope. Especially distinctive symptoms of severe *Lygus* damage result from the development of racemes of buds near the tips of main stems and branches into disc or knob-like structures called rosettes. It appears, however, that conditions other than *Lygus* infestation may also contribute to the development of these bud clusters. A bud damage in alfalfa described as bud abortion has been shown to occur on plants from which *Lygus* bugs are excluded, in which case physiological conditions affecting growth and development appear to be the principal causes of damage. Bud abortion is, however, distinctly unlike the damage that develops from *Lygus* punctures.

Injury to fully developed alfalfa flowers may also result from *Lygus* infestation, and is shown in sectioned and stained material as punctures and lacerations similar to those in buds. Damaged flowers, as a rule, are shed soon after injury so that discoloration and disintegration are not conspicuously noticeable while the flowers remain attached to the plant. Since alfalfa is extremely variable in its reproductive behavior, it is known also to shed its flowers in the apparent absence of de-

structive insects. The degree of effective pollination has been shown by various investigators to be a limiting factor for seed production. A failure to set seed when alfalfa flowers have been pollinated is apparently the result of lack of fertilization even though pollen tubes are present in the ovaries. Owing to conditions affecting growth and development, pollen tubes sometimes fail to reach all of the ovules, and even when fertilization is effected, embryo abortion may occur at various stages in seed development.

Comparison of Infested and Non-Infested Plants

A comparative study was made of growth and development in alfalfa plants infested and not infested by *Lygus* bugs. Young plants in the pre-bud stage of growth and development and approximately eight inches high were artificially infested for a period of 22 days, while similar plants were dusted 5 to 7 times weekly with an insecticide composed of sulfur dust and pyrethrum extract in the respective proportions of 85 and 15 percent to prevent infestation and damage by the insects. The effects of these treatments on the growth of the plants are shown in figure 3. The photographs were taken to the same scale to show the effects directly. After 15 days of infestation, infested plants had an average height of 12.4 inches, as compared with 17.2 inches for the uninfested insecticide treated plants. At the end of 22

The *Lygus* problem in alfalfa seed production from the entomological viewpoint has been studied by Professor C. J. Sorenson of the Entomology Department and the results are published in Bulletin 284. Copies may be obtained on request.

days when the plants were in full bloom, the average heights were 14.5 and 21.3 inches for infested and uninfested plants, respectively. These differences in growth and development are presumably largely attributable to the effects of *Lygus* infestation, although there is some evidence to indicate that the sulfur applied with the insecticide to the uninfested plants may also have produced a stimulating physiological effect that aided growth in the plants free from the effects of *Lygus* infestation. An average of 40.8 branches developed on 3 main stems of infested plants, as compared with 25.5 on 3 main stems of uninfested plants. Excessive branching resulting from *Lygus* infes-

NEW PUBLICATIONS

Bul. 296. Uton, a new high-yielding white oat resistant to loose and covered smuts.—D. C. Tingey, R. W. Woodward, T. R. Stanton.

Uton, a new oat variety developed here, not only has a large white kernel, but is resistant to both loose and covered smut. It has produced yields somewhat higher than either Swedish Select or Markton in trials. It is recommended to replace these varieties.

Cir. 115. Forest and watershed fires in Utah.—Ernest O. Buhler.

This circular reports results of a study of the fire situation on state, county, municipal, and privately owned forest and range lands essential in watershed protection.

Either of these publications may be obtained free by addressing a card to the Utah Agricultural Experiment Station, giving the number and series of the publication desired.

tation gives to infested plants the appearance of the "stringiness" referred to previously. Infested and uninfested plants developed approximately the

same number of leaves per main stem. The condition of the leaves, however, was strikingly different. An average of 21.8 percent of those on infested plants were crinkled or deformed, as compared with 1.6 percent of those on uninfested plants.

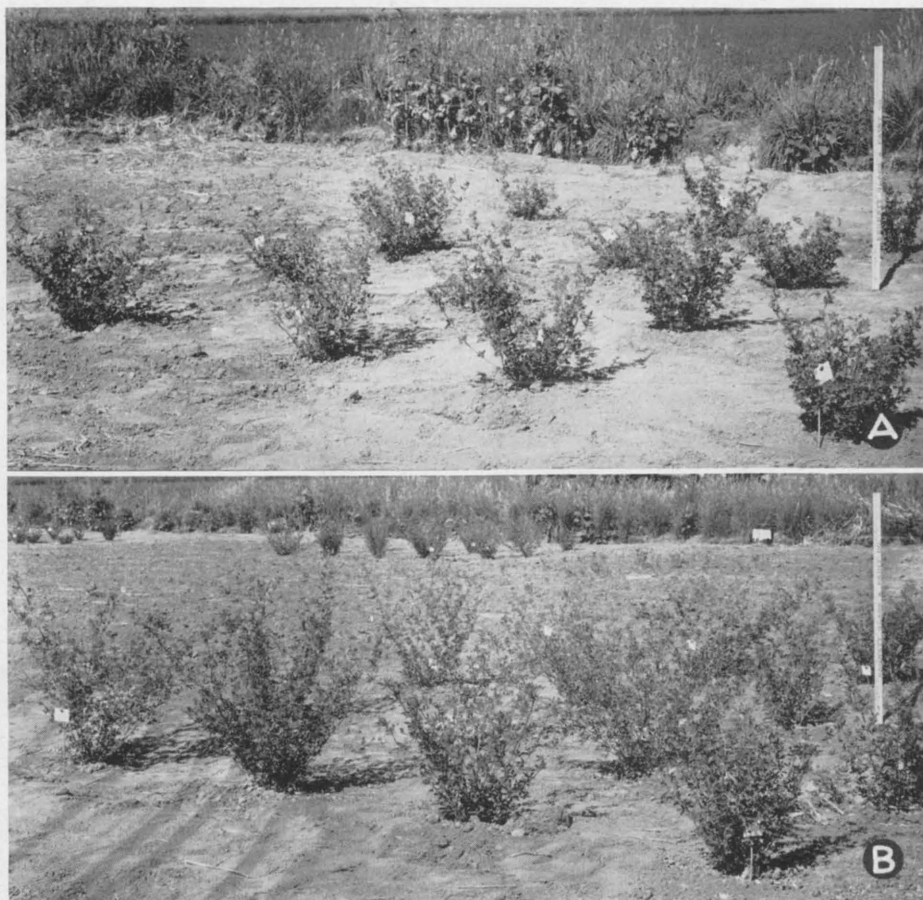
When *Lygus* were removed from infested plants by frequent application of the insecticide, a general recovery from the effects of the previous infestation became noticeable after 5 to 10 days. Recovery, however, was generally incomplete, since infested plants produced on the average only 7.07 grams of seed per plant, as compared with about 12 grams for uninfested plants. Plants infested continuously through the season with *Lygus* produced on the average only 2.30 grams of seed per plant.

The importance of *Lygus* bugs as a factor in alfalfa-seed production is evident from the nature of the damage to the buds and flowers, the occurrence of these insects in relation to low seed yields and sometimes seed-crop failures, and by the marked improvement in yield of seed resulting when the insects are effectively controlled.

Figure 3. Showing the effects of "*Lygus*" infestation on the early growth and development of alfalfa plants

A. Infested from pre-bud to full bloom stage of development

B. Uninfested and dusted 5 to 7 times weekly for the same period



LAND-USE PLANNING

(Continued from page 1)

representatives from all of the Land-Grant Colleges and of the Department of Agriculture met in the summer of 1938 at Mount Weather, Virginia. Out of that meeting came the now famous Mount Weather Agreement, and the birth of land-use planning on a national scale. Under this agreement the Department and the Land-Grant Colleges undertook the task of helping farmers to set up the necessary community, county and state organizations and program planning procedures. And since nearly all the national and state agricultural programs bear directly or indirectly on the use of land, land-use planning seemed the logical place to begin.

State Land-Use Planning Committee

Following this agreement, Utah along with 45 other states, set up a State Land-Use Planning Committee composed of 12 representative farm men and women and a representative from each of the federal agricultural agencies and from each of the important state agencies dealing with agriculture, including the director of the Agricultural Experiment Station. The director of the Agricultural Extension Service was designated chairman and the state representative of the Bureau of Agricultural Economics, secretary of the state committee.

Land Grant College—BAE Committee

In addition a joint Land-Grant College—Bureau of Agricultural Economics Committee was organized in each state to serve as a working committee to coordinate the efforts of the state and county committees, the Experiment Station, the Extension Service and the Department of Agriculture in the land-use planning process.

The Utah committee is composed of Dr. W. P. Thomas, representing the Agricultural Experiment Station, Alvin G. Carpenter, representing the Agricultural Extension Service, and Dr. Dilworth Walker, representing the United States Department of Agriculture through the Bureau of Agricultural Economics, which has been given the responsibility for the general planning work of the Department.

Land-Use Planning Seminar

More recently, a land-use planning seminar sponsored by the Joint Land-Grant College—BAE Committee has been organized at the Utah State Agricultural College. Dr. R. H. Walker is

chairman and the seminar membership is made up of selected representatives from leaders in Experiment Station and Extension work and from the federal agricultural agencies. The seminar meets each week to discuss such land-use planning problems as water, land and feed resources, types of agriculture best suited to different areas, present and proposed research projects, agricultural problems presented by community, county and state planning committees and any other topics related to the economic or social welfare of the rural people of the state.

Through the work of all these planning agencies, this cooperative effort on the part of representative farmers, various agencies of the Department of Agriculture, the Land-Grant Colleges, and other state and local agencies will be able to work out agricultural plans, policies and action programs that will (1) aid in better coordinating the various state and federal agriculture programs so that they will fit together in a well-rounded whole, (2) help them function more effectively toward long-time as well as emergency goals, and (3) assist in developing any new programs that may be needed. In short, it is hoped that through this coordinated land use planning process the various state and governmental agencies can work together more harmoniously and more effectively in improving the economic and social welfare of the rural people of Utah.

Just now the State Land-Use Planning Committee is cooperating with the National Defense Council in developing a unified state agricultural program to meet the impacts of war. It is most fortunate that land-use planning is organized and well under way in Utah so that this emergency can be met effectively, and if it proves to be a useful process in effectively coping with such important war impact problems, perchance it will prove to be a useful procedure in solving the post war and peace time problems long after the present emergency has passed.

—Joint Land Grant College-BAE Committee.

REGIONAL SALINITY LABORATORY

(Continued from page 5)

sen, research professor of irrigation and drainage, is the collaborator representing the Utah Station. Among the other collaborators are soil chemists, agronomists, horticulturists, plant nu-

tritionists, and others who may properly represent the varied phases of research being undertaken by the Salinity Laboratory. These collaborators meet at least once each year to review the progress of the research and to develop and approve plans for future investigations. This plan of a coordinated cooperative attack on this huge problem is working out unusually satisfactorily and offers considerable promise for the success of the undertaking.

The general objectives of the research are to study the basic principles of salt action in the soil and the effects of various salts and concentrations of salts on plant growth and development. The effort of the laboratory will, in the main, be devoted to the development of new information concerning the laws and principles governing alkali control and the management of saline lands and irrigation waters. The agricultural experiment stations in the several states can then relate the general information to the reclamation of alkali lands and the control of alkali in the various local communities of their states. Local irrigation and drainage districts or other public or private organizations, or even individual farmers, can then be directed and advised concerning the practicable methods of managing their alkali lands. It is believed that in this manner most rapid strides will be made toward the solution of our alkali troubles on the irrigated lands of the West.

The Utah Agricultural Experiment Station has several projects under investigation that have a bearing on the alkali and salinity problem. These will be described in a future issue of this magazine. Suffice it to say here that it is extremely important for us to learn how to manage our lands to prevent the further encroachment of alkali salts upon them in order that we may protect and conserve for future production the relatively few acres of good land we now have. Furthermore, we should definitely look forward to the improvement of lands now affected with the alkali salts. Many farmers of Utah are attempting to wrest a living from lands that are so impregnated with alkali salts that efficient crop production is impossible. The improvement of these lands is needed for the security of our rural people, and for the necessary agricultural production of Utah. It is to the research investigations on the salinity problems that we must look for the hope of the future for these lands.



Youth study schedules being checked by Rural Sociology Department. Seated, left to right: Carmen Frederickson, research assistant; Dr. Geddes; Elizabeth Fine, from the Berkeley office, Division of Farm Population and Rural Welfare

UTAH YOUTH STUDY

(Continued from page 1)

a start in life has penetrated the thinking of many Utah people. The problem is no longer an individual one. More and more social responsibility is being recognized. Youth conferences are more numerous than formerly. County Land Use Planning sub-committees on youth have been organized in many Utah counties. Higher education has become more widely diffused in Utah than in most other states.

Certain questions for which satisfactory answers are not yet available are repeatedly asked by leaders in diverse fields. Who are most numerous among those who are leaving Utah? Are they the aged and small children, both of whom belong to the dependent classes? Are they the unskilled laborers who are

attracted by high wages in the industries of American cities? Are they the young unmarried or the middle aged? Are they the graduates of college, who, unable to find opportunities at home, seek them elsewhere?

Cooperative Study

To ascertain the facts about education, employment and migration of youth in Utah, the United States Bureau of Agricultural Economics, the Utah State Department of Education and the Utah Agricultural Experiment Station are cooperating in a study of the youth of Utah. Information concerning Utah youth is being gathered through the public schools of the state by the staff of the Sociology Department of the Station. Dr. Michael R. Hanger of the Pacific Division of Farm Population and Rural Welfare of the Bureau of Agricultural Economics is directing the analysis of the data.

Specific inquiries made through the study are: What is the nature of youth

population problems in Utah? Where, in Utah, is youth population pressure greatest as related to economic opportunity? What Utah areas are losing youth through migration? Are youth migrants seeking better economic opportunity within the state or without its borders; and if without, where are they going? What is the education of migrating Utah youth? Is age of parents and size of family related to migration? What are the occupations of parents of youth who leave the state? Is the rate of migration of Utah youth increasing or decreasing? To what extent is migration related to farm ownership and farm tenancy? What occupations are contributing most to mobility of youth? At what ages do Utah youth most commonly leave home? Does the rate of migration differ with family religion? Is mobility of youth related to farm residence, i.e., location of home on the farm, in the village, or on the edge of village?

Most of the schools in Utah have participated in the study. It is estimated roughly that approximately 75,000 persons have been reported on in the schedules. The study is thus extensive rather than intensive. Although the sample is large it is far from a census enumeration. More intensive studies should follow in specific areas. It is hoped that a publication covering major findings will appear late in the summer or early fall of 1941.

NURSE CROPS

(Continued from page 6)

first year and often during the second year also, the extra forage yield obtainable during the first and second years from plantings containing a small-grain nurse crop is of little importance. The very serious reduction in perennial grasses seems to more than offset any advantages that might arise from high yields of rye.

While the benefits from supposed protection given seedling grasses by winter rye may vary from year to year as the climate varies, the results herein reported seem to indicate that, rather than protecting the seedlings from drying sun and hot winds, rye actually draws moisture from the soil that might

otherwise be available for grass. On arid lands this drying may kill the grass plants and will certainly reduce their yield. For this reason, the use of a small-grain nurse crop, with the possible exception of irrigated pastures and wetter mountain ranges, cannot be recommended for Utah.

GRASS BREEDING

(Continued from page 7)

capacity over a number of years. Studies with smooth brome have shown that the first reproductive season is especially unreliable as an indicator of the total yield of a plant for the first three reproductive seasons. Preliminary studies also indicate that different sources of smooth brome show marked differences in vigor. These different

sources are actually strains (though unnamed, and unidentified as such) which have become differentiated through the selective action of their environments.

In the program in progress at Logan, several promising selections are being rapidly increased for practical, large scale tests in order to determine their value more accurately. Inbreeding, hybridization, vegetable propagation and other techniques are being employed. A wide range of source material is being examined. Owing to the integrated action of grass improvement programs being conducted in each of the major agricultural areas of the country, grass and the problems related to its improvement are receiving the attention which it, as a crop of primary agricultural value, rightly deserves.

HOME LANDSCAPING ENRICHES RURAL LIVING

By LAVAL S. MORRIS

A GENERATION ago many rural homes were merely places in which to stay. Today there is a strong tendency to make them places in which to live, and many rural homes have become more inviting and livable than town or city homes.

During the past two thousand years wealthy families have moved to the country because the air was better, the living space was greater and the views were great pictures spread over all the landscape. These are real advantages not only to the more wealthy classes but to anyone living in rural districts. Not many years ago those who lived in the country were somewhat isolated, rusticated, and were called hay seeds. Today the automobile, the radio and the newspaper have made us next door neighbors with all people and yet the rural dweller still has the advantages offered by the open country.

Rural people are rapidly realizing

that it is just as important to improve the livability and beauty of their homes as their neighbors in the city. This has been demonstrated during the past two years by the thousands of gallons of paint applied to old buildings; also by the many fences which have been repaired and the general improvement of physical conditions about the farms. In a few more years the family who permits barns and other outbuildings to remain unpainted, home yards to be unplanted and general unsightliness to remain will be conspicuous in an ugly way, because all the neighbors will have accomplished the job of landscaping their home yards.

Landscaping rural homes is not an expensive luxury. Nine-tenths of the job is composed of having the yard neat and orderly. A few shrubs and trees do much to soften the foundations of houses and provide shade for hot days. The larger shrubs for screening

purposes, such as lilac, Tatarian honeysuckle and dogwood need not be closer together than from five to seven feet. Many native plants lend themselves well to landscaping the rural home. They are adapted to both soil and climate and are often more beautiful than the exotic plants because they are healthy under local conditions, while many exotic ones do not survive in our soil or climate.

Rural living is enriched by landscape improvements.

Copper containers, copper wire, shavings, or shot prolong life of some cut flowers including aster, daffodil, stocks, snapdragons, annual chrysanthemum, calendula, pansy, marigold, and yellow daisy. Copper proves detrimental to the carnation.

Cutting stems under water aids snapdragon, carnation, sweet pea, yellow daisy, aster, annual chrysanthemum and marigold.

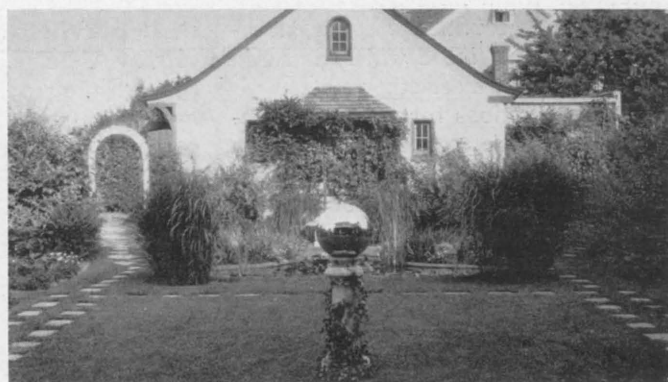
Vitamin B₁ has NOT proved beneficial in prolonging the life of a wide range of flowers.

College series no. 611

Well planned foundation planting helps tie the house and grounds together



A side or rear garden enclosed by shrubbery makes an ideal summer living room



Agricultural Experiment Station

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